HW practice problem answer key

1. PTC tasting = dominant phenotype PTC non-tasting = recessive phenotype

* 243/2700 = .09 = non-tasting frequency = q2
* Square root .09 to get .30 as q
* Solve for p to get .70
* Freq. HD individuals = p2 = .7 x .7 = .49
* Freq. hetero individuals = 2pq = 2 x .7 x .3 = .42
* Freq. HR individuals = q2 = .3 x .3 = .09
* Freq. dom. allele = p = .70
* Freq. rec. allele = q = .30

2. Normal talk = dominant phenotype Pirate talk = recessive phenotype

* 320/2000 = .16 = pirate talk frequency = q2
* Square root .16 to get .40 as q
* Solve for p to get .60
* Freq. hetero individuals = 2pq = 2 x .4 x .6 = .48
* Freq. dom. allele = p = .60
* Freq. rec. allele = q = .40

3. Hair = dominant phenotype No hair = recessive phenotype

* 7350/15000 = .49 no hair frequency = q2
* Square root .49 to get .70 as q
* Solve for p to get .30
* Freq. HD individuals = p2 = .3 x .3 = .09
* Freq. hetero individuals = 2pq = 2 x .3 x .7 = .42
* Freq. HR individuals = q2 = .7 x .7 = .49
* Freq. dom. allele = p = .30
* Freq. rec. allele = q = .70

4. Long 2nd toe = dominant phenotype Long big toe = recessive phenotype

* 19968/31200 = .64 long big toe frequency = q2
* Square root .64 to get .80 as q
* Solve for p to get .20
* Freq. dom. allele = p = .2
* Freq. rec. allele = q = .8
* Freq. HD individuals = p2 = .2 x .2 = .04
* Freq. hetero individuals = 2pq = 2 x .2 x .8 = .32

5. This is an example of incomplete dominance so p and q are both DOMINANT alleles! I am writing p as the red allele and q as the white allele just because I want to.

Red = dominant genotype/phenotype (p2)

White = dominant genotype/phenotype (q2)

Purple = incompletely dominant genotype/phenotype (2pq)

* 80/500 = white phenotype = .16 = q2
* Square root .16 to get .40 as q
* Solve for p to get .60
* NUMBER of plants expected to be red must be figured out by multiplying the frequency of red (p2) by the total population size (500).
  + Freq. Red = p2 = .6 x .6 = .36
  + NUMBER of Red = .36 x 500 = 180 plants will be Red.
* NUMBER of plants expected to be purple must be figured out by multiplying the frequency of purple (2pq) by the total population size (500).
  + Freq. Purple = 2pq = 2 x .6 x .4 = .48
  + NUMBER of Purple = .48 x 500 = 240 plants will be Purple.
* Freq. white allele = q = .40
* Freq. red allele = p = .60

6. ACHOO = dominant phenotype No ACHOO = recessive phenotype

* 5250/21000 = .25 No ACHOOO frequency = q2
* Square root .25 to get .50 as q
* Solve for p to get .50
* Freq. rec. allele = q = .5
* NUMBER of students expected to be heterozygous must be figured out by multiplying the frequency of heterozygotes (2pq) by the total population size (21000).
  + Freq. hetero. = 2pq = 2 x .5 x .5 = .50
  + NUMBER of hetero. = .50 x 21000 = 10500 students heterozygotes
* NUMBER of students expected to be HD must be figured out by multiplying the frequency of HD (p2) by the total population size (21000).
  + Freq. HD. = p2 = .5 x .5 = .25
  + NUMBER of HD. = .25 x 21000 = 5250 students HD

7. Normal Blood = dominant phenotype SCA Blood = recessive phenotype

* Problem states rec. allele freq. is .05 = q
* Solve for p to get .95
* Freq. dom. allele = p = .95
* Percent. HR = q2 = .05 x .05 = .0025 = .25%
* Percent. Hetero. = 2pq = 2 x .95 x .05 = .095 = 9.5%
* Percent HD = p2 = .9025 = 90.25%